

**National Aeronautics and Space Administration
(NASA)**

Acquisition Pollution Prevention (AP2) Office

Field Evaluations Test Plan

**For Validation of Alternative Low-Emission Surface
Preparation/Depainting Technologies for Structural
Steel**

FINAL

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January 31, 2005

Contract No. NAS10-03029

Task Nos. 1 and 6

*Prepared by
International Trade Bridge (ITB), Inc.
Beavercreek, OH 45432*

*Submitted by
NASA Acquisition Pollution Prevention (AP2) Office*

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PREFACE

This report was prepared by International Trade Bridge, Inc. (ITB) through the National Aeronautics and Space Administration (NASA) Acquisition Pollution Prevention (AP2) Office under Contract Number NAS10-03029 Task Order Nos. 1 and 6. The structure, format, and depth of technical content of the report were determined by the NASA AP2 Office, Government contractors, and other Government technical representatives in response to the specific needs of this project.

The information contained in this plan is to be used in conjunction with NASA AP2 Office documents entitled *Joint Test Protocol for Validation of Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, *Potential Alternatives Report for Validation of Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, and *Cost Benefit Analysis for Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, all of which were prepared by ITB.

The information contained in this report was leveraged from the Air Force (AF) document entitled *DRAFT Purchase Description Remover, Chemical, Non-Chlorinated Solvent Type, For Difficult-To-Remove Finishes at All Air Force Installations*, prepared by the AF Coatings Technology Integration Office (CTIO) and the Air Force Research Laboratory (AFRL) document entitled *DRAFT The Testing and Demonstration of Metal Wire Arc Sprayed Materials on Rocket Launch Facilities*, dated November 26, 2003, prepared by Science Applications International Corporation (SAIC).

We wish to acknowledge the invaluable contributions provided by all the organizations involved in the creation of this document.

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1. INTRODUCTION

Headquarters National Aeronautics and Space Administration (NASA) chartered the Acquisition Pollution Prevention (AP2) Office to coordinate agency activities affecting pollution prevention issues identified during system and component acquisition and sustainment processes. The primary objectives of the AP2 Office are to:

- Reduce or eliminate the use of hazardous materials (HazMats) or hazardous processes at manufacturing, remanufacturing, and sustainment locations.
- Avoid duplication of effort in actions required to reduce or eliminate HazMats through joint center cooperation and technology sharing.

NASA and Air Force Space Command (AFSPC) have similar missions and therefore similar facilities and structures in similar environments. Both are responsible for a number of facilities/structures with metallic structural and non-structural components in highly and moderately corrosive environments. Regardless of the corrosivity of the environment, all metals require periodic maintenance activity to guard against the insidious effects of corrosion and thus ensure that structures meet or exceed design or performance life. The standard practice for protecting metallic substrates in atmospheric environments is the application of an applied coating system. Applied coating systems work via a variety of methods (barrier, galvanic and/or inhibitor) and adhere to the substrate through a combination of chemical and physical bonds.

To achieve a substrate condition suitable for the application of a coating system, both new and old (in-situ) substrates must undergo some type of surface preparation and/or depainting operation to ensure adhesion of the new coating system. The level of cleanliness or anchor profile desired is typically a function of the type of coating to be applied and the specification being adhered to. In high performance environments, cleanliness and surface profile requirements for carbon steel (the dominant substrate for facilities, structures and equipment) dictates the use of abrasive media. Many of the abrasive media currently used across NASA and AFSPC installations generate large quantities of fugitive particulate emissions and waste. The high quantities of airborne dust and waste generated from these operations pose significant environmental concern. Efforts to contain emissions and the reduce quantity of waste generated have significant implications on project cost; this is often a deterrent to engaging in maintenance activities.

In response to recent technological developments and NASA's and AFSPC's need to undertake environmentally conscious corrosion prevention projects, a review of the industry needs to be undertaken to evaluate surface preparation technologies (materials and processes) for embrace. This project will identify, evaluate and approve alternative surface preparation technologies for use at NASA and AFSPC installations. Materials and processes will be evaluated with the goal of selecting those processes that will improve corrosion protection at critical systems, facilitate easier maintenance activity, extend maintenance cycles, eliminate flight hardware contamination and reduce the amount of hazardous waste generated.

This Field Evaluations Test Plan defines the field evaluation and testing requirements for validating alternative surface preparation/depainting technologies and supplements the JTP. The field evaluations will be performed at Stennis Space Center, Mississippi, under the oversight of the Project Engineer. Additional field evaluations may be performed at other NASA centers or AFSPC facilities.

The Joint Test Protocol (JTP) entitled *Joint Test Protocol for Validation of Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, prepared by ITB, contains the critical requirements and tests necessary to qualify alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel Applications. These tests were derived from engineering, performance, and operational impact (supportability) requirements defined by a consensus of NASA and AFSPC participants.

The Potential Alternatives Report (PAR) entitled *Potential Alternatives Report Plan for Validation of Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, prepared by ITB, provides technical analyses of identified alternatives to the current surface preparation/depainting technologies, criteria used to select alternatives for further analysis, and a list of those alternatives recommended for testing.

The Cost Benefit Analysis (CBA) entitled *Cost Benefit Analysis for Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, prepared by ITB, evaluates investments in environmental technologies that address compliance and pollution prevention issues. The CBA quantifies the estimated capital and process costs of coating removal alternatives, Return-on-Investments, and cost savings relative to the current coating removal process to determine if implementation of the candidate alternatives is economically justified.

A Joint Test Report (JTR) will document the results of the testing as well as any test modifications made during the execution of the testing. The JTR will be made available as a reference for future pollution prevention endeavors by other NASA centers, the Department of Defense (DoD) and commercial users to minimize duplication of effort. Users of this JTP should check the project's JTR for additional test details or minor modifications that may have been necessary in the execution of the testing. The technical stakeholders will have agreed upon test procedures modifications documented in the JTR.

The current coating removal processes identified herein are for polyurethane, epoxy and other paint systems applied by conventional wet-spray processes. Table 1 summarizes the target HazMats; processes and materials; applications; affected programs, and candidate substrates.

Table 1-1 Target HazMat Summary					
Target HazMat	Current Process	Applications	Current Specifications	Affected Programs	Candidate Parts/Substrates
Airborne Particulates and Contaminated particulate matter	Dry Abrasive Blasting	Maintenance of Test Stands, Ground Support Equipment, Shuttle Support Structures, Launch Pads, Towers and general structures.	SSPC-SP-5; SSPC-SP-10	Ground Support and Facilities Maintenance	A36 Carbon Steel

2. ENGINEERING, PERFORMANCE, AND TESTING REQUIREMENTS

A joint group led by the AP2 Office and consisting of technical representatives from NASA centers and AFSPC reached technical consensus on engineering, performance, and testing requirements for alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel Applications. The joint group defined critical tests with procedures, methodologies, and acceptance criteria to qualify alternatives against these technical requirements.

The objective of this project is to qualify candidate alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel Applications under the specifications for the standard system. This project will compare surface preparation/depainting performance of the proposed alternatives to existing surface preparation/depainting systems or standards.

Field evaluations demonstrate comparative field performance of candidate surface preparation/depainting technologies when applied on operating structures. The field evaluations will be performed in conjunction with the laboratory tests as specified in NASA AP2 Office Joint Test Protocol entitled *Joint Test Protocol for Validation of Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, prepared by ITB.

Field testing is perhaps one of the most critical screening tests. Application of the chosen mechanical removal methods in a field environment is the only true test of which will demonstrate removal viability. It is expected that the field demonstration will serve to eliminate several variables and provide concrete evidence of the cost and environmental impact of alternatives. Information gathered from this field trial is critical for local environmental, safety, and occupational health (ESOH) personnel along with technical stakeholders to be able to make educated decisions on process standardization and what further capital and testing is warranted.

The generated data will be recorded on the "Depainting System Field Evaluation and Inspection Report" (Appendix A), or an equivalent form, and through video and photographic documentation. This demonstration should serve to answer the key questions:

"What is the exposure to the worker and environment?"

"How efficient is the removal?"

"How well prepared is the surface?"

"How will the preparation affect the life cycle of the coating?"

"What is the initial, operating and life cycle cost of the preparation method?"

The field screening demonstration will also provide cost justification data for what equipment will be best purchased for this project, and further define any variables on laboratory testing required.

A primary concern for the field screening is to ensure that the safety of equipment or personnel is not jeopardized. Timing of the demonstration will depend upon requirements identified by local environmental and safety personnel, weather forecast, and coordination of the schedules of key personnel.

Table 2-1 lists field evaluations that are intended to compare the performance of candidate test surface preparation/depainting technologies with current surface preparation/depainting systems when applied in an operational environment.

The table includes acceptance criteria and the reference specifications, if any, used to conduct the tests. The proposed test and evaluation are based on the aggregate knowledge and experience of the assigned technical project personnel and prior testing where "None" appears under *Test Method References*.

Table 2-1 Field Evaluation Engineering, Performance, and Testing Requirements for Alternative Low-Emission Surface Preparation/Depainting Technologies				
Test	Test Plan Section	Test Specimen	Acceptance Criteria	Test Methodology References
Ease of Use	3.2.1.	Field	To be assessed by field applicator; comparison of noise levels	None
Coating Strip Rate	3.2.2.	Field	1.7 ft ² /min at 6 mil thickness or equivalent	None
SSPC Surface Cleaning Level	3.2.3.	Field	Concurrence that technology meets agreed upon cleaning level using visual determination using SSPC Surface cards at 10X magnification	SSPC-SP-10/ NACE-NO. 2
Surface Profile/ Roughness	3.2.4.	Field	Concurrence that technology meets agreed upon surface profile using visual determination	NACE-STD-RP0287
Waste Generation	3.2.5.	Field	Less than current abrasive blasting techniques	None
Particulate Generation	3.2.6.	Field	Less than current abrasive blasting techniques	None
Coating Removal Damage Appraisal	3.2.7.	Field	No warping/denting or metal erosion observable at 10X magnification	None

3. TEST DESCRIPTIONS

Field evaluations demonstrate comparative field performance of candidate coating removal technologies with currently used coating removal systems. The field evaluations will be performed simultaneously with laboratory testing.

Test requirements identified in Table 2-1 are further defined in this section to include the test description, rationale, and test methodology. The *Test Methodology* lists the major parameters and acceptance (pass/fail) criteria. Any *Unique Equipment or Instrumentation* requirements and *Data Analysis and Reporting Criteria* are also included.

3.1. Field Coating Removal, Testing, and Waste Handling

A. *Removal*: The Project Engineer shall propose the removal processes to be tested in accordance with industry accepted standards. This removal process will be approved for testing by the Center's Environmental and Industrial Health departments and the host organization performing the coating removal. During removal, the Project Engineer will record data pertinent to the removal efficiency, labor requirements, surface condition, and waste generation for each method used as specified by the tests listed in Section 3.2.2.

B. *Sampling*: The on-site contractor shall be responsible for collection and testing of waste stream samples at completion of the removal process or during interim cleanup of the project area. To insure proper test results, it is imperative that the waste stream be segregated from any other waste generated on the job site.

C. *Chain of Custody*: The on-site contractor shall insure a proper chain of custody form is filled out for each sample. Test results obtained without proper chain of custody documentation shall be deemed invalid.

D. *Collection*: Sufficient samples shall be taken to insure proper categorization of the waste stream. At a minimum, 1 sample each per test method shall be collected. As a safety measure, duplicate samples of each waste stream shall be taken and delivered to the owner for archiving. The duplicate samples shall be collected, labeled, and delivered using the same protocols as those sent to the laboratory for analysis.

E. *Testing*: The above samples shall be delivered to an accredited laboratory for testing using proper chain of custody documentation. TCLP tests shall be completed in accordance with EPA Method 1311 as found in Appendix II of 40 CFR 261. The laboratory shall submit copies of the test results directly to the contractor, owner, and owner's environmental representative.

F. *Submittals*: The following information shall be submitted to the owner or his designee.

- a. *Product Data*: Submit one copy of the manufacturer's product specifications and application guidelines.
- b. *Material Safety Data Sheets*: Submit one copy of Material Safety Data Sheets for all products to be used on the job site.
- c. *Personal Protective Equipment*: Submit a list of personal protective equipment to be used during application, curing, and removal.

G. *Training*: The contractor shall be responsible for insuring all employees are informed about specific handling procedures and work practices involved with the use of prospective chemicals. Trained personnel will operate equipment. An on-site safety meeting shall be held prior to commencement of application procedures.

H. *Storage*: Flammable material shall be stored in a cool dry area away from heat, sparks, direct sunlight and open flame. NO SMOKING signs shall be placed on the storage area in a conspicuous location. The contractor shall be responsible to insure storage of flammable materials is in accordance with applicable federal, state, and local regulations.

I. *Test Results*: Submit copies of all TCLP Test results as stipulated to the host organization, Base Environmental – Bio, Contractor and the Project Engineer

J. *Warranties*: Submit copies of manufacturer's product warranties and any additional warranties to be provided by the contractor.

K. *Hazardous Waste*: Paint debris shall be classified as hazardous if after testing for toxic characteristics using the TCLP test methods, the leachate contains any of the elements in concentrations at or greater than those listed in 40 CFR 261 or applicable state or local regulations. In any circumstance, the most stringent jurisdictional regulations governing the project location shall apply.

L. *Generator*: The host unit and contractor shall be considered co-generators of all waste material generated as a result of the construction activities governed by these specifications.

M. *Nonhazardous Wastes*: Waste material that has measured leachability less than those levels indicated in section K and has not been classified as a hazardous waste for other properties or constituents shall be transported and disposed of as industrial wastes in accordance with the governing federal, state, and local regulations.

N. *Hazardous Wastes*: Should test results indicate waste material is classified as hazardous in accordance with RCRA regulations, the contractor shall dispose of all waste materials in accordance with but not limited to 40 CFR 260-268 and other state and local regulations.

O. *Site Storage and Handling*: The contractor shall pay strict attention to the requirements of 40 CFR 262 and 40 CFR 265 for on-site handling of debris. Special attention shall be given to the time of storage, amount of material stored at any one time, use of proper containers, personnel training and confirmation that an EPA Identification Number is obtained.

P. *Material Storage*: Paint debris shall not be placed on unprotected ground and shall be shielded to prevent dispersion of the debris by wind or rain. Any evidence of improper storage shall be cause for immediate shutdown until corrective action is taken.

Q. *Preparedness, Prevention, and Contingency Plans (PPCP)*: The contractor shall prepare and retain on-site a PPCP in accordance with 40 CFR 265 Subparts C & D for steps to be taken in the event of an unplanned release.

R. *CERCLA Release*: The contractor is advised that the discharge of 10 or more pounds of elemental lead into the water, soil, or air within a 24 hour period is considered a reportable release in accordance with 40 CFR 302.4. Elemental lead shall be calculated based upon the total percent lead concentration of the coating being removed.

S. *Transportation*: The contractor shall arrange for the transportation of the debris from the site in accordance with the requirements of 40 CFR 263, and disposed of in accordance with 40 CFR 264 and 40 CFR 268 including the necessary notifications, certificates, and manifests for shipments. Only licensed transportation and disposal facilities shall be used. Proof of licensing shall be provided within 24 hours of the owner's written request.

T. *Manifesting*: The contractor shall be responsible for providing copies of waste shipment manifests to the host organization verifying that all steps of the handling and disposal have been completed in accordance with the applicable regulations.

3.2. Field Demonstration Tests

Test requirements identified in Table 2-1 are further defined in this section to include the test description, rationale, and test methodology. The *Test Methodology* lists the major parameters and acceptance (pass/fail) criteria. Any *Unique Equipment or Instrumentation* requirements and *Data Analysis and Reporting Criteria* are also included.

3.2.1. Ease of Use

Test Description

This procedure is used to determine how easily a coating removal technology may be used. Follow manufacturers' instructions for operation. Noise level is also measured during this test. Noise levels shall be measured using a Type II Sound Level Meter set at slow response and recorded for comparison.

Rationale

This test is conducted to identify and eliminate those candidate coating removal technologies that are difficult to properly use under normal maintenance operation conditions. All participants have agreed that *Ease of Use* is a performance requirement.

Test Methodology

Table 3-1 Test Methodology for Ease of Use	
Parameters	Manufacturer instructions
Field Test Evaluation	Step up time, Ease of step up process, Cost of mobilizing and demobilizing; Noise Levels
Acceptance Criteria	To be assessed by field applicator; comparison of noise levels

Unique Equipment and Instrumentation

- Type II Sound Level Meter

Data Analysis and Reporting

On the “Depainting System Field Evaluation and Inspection Report” (Appendix A), or an equivalent form, report:

- Engineering evaluation substantiated by written description
- Noise Levels

3.2.2. Coating Strip Rate

Test Description

This procedure is used to determine the rate of coating removal. Paint strip rate test data shall be based on a minimum test area equal to 16 ft². All coating shall be removed down to the substrate. The equipment manufacturer’s instructions shall be followed for operation of the coating removal technology.

Rationale

This test is conducted to validate strip rates of the candidate coating removal technologies. The coating strip rate of the coating removal technology must meet or exceed strip rates established by NASA participants. Acceptance criteria shall be based on requirement analysis or survey results and/or 1.7 ft² per minute at 6 mils nominal thickness.

Note: The test areas used for coating removal rate will be evaluated immediately after coating removal for surface damage. Due to this fact, it is imperative that the surface of all test areas be examined for any irregularities prior to the coating application. Test areas exhibiting irregularities shall not be used.

Prior to coating removal rate evaluation, each test area shall have dry film thickness readings made at a minimum of nine symmetric locations on the area for the primer coat and the total coating thickness (primer plus topcoat). Coating thickness measurements shall be to a resolution of 0.1 mil (0.0001 inch). This documentation shall be provided with strip rate data for each test panel.

Test Methodology

Table 3-2 Test Methodology for Coating Strip Rate	
Parameters-Recorded during or immediately following Test trial	Total stripping time per each coating (minutes); Stripping surface area (ft ²); Average Coating Thickness (mils) of each coating stripped; Process parameters must be recorded and reported, including: average power, pulse width, pulse frequency, pulse energy, beam spot size at work surface, scan/raster rate or traverse rate.
Field Test Evaluation	The strip rate for each process or media will be measured in the field to assess productivity rates.
Acceptance Criteria	Acceptance criteria based on requirement analysis or survey results and/or 1.7 ft ² per minute at 6 mils nominal thickness.

Unique Equipment or Instrumentation

- None

Data Analysis and Reporting

On the “Depainting System Field Evaluation and Inspection Report” (Appendix A), or an equivalent form, report:

- Paint strip rate data shall be presented as ft²/minute for a given set of constant process parameters, paint thickness (layered and non-layered coatings) and per coatings system. This data shall be the arithmetic mean value of three tests.

- An assessment of the degree of coatings removal shall be submitted with the strip rate data. A description of the methods used to maintain constant parameters and equipment settings shall be documented.

3.2.3. SSPC Surface Cleaning Level

Test Description

This test shall be performed in accordance with SSPC-SP-10/NACE-No. 2 (*Near-White Blast Cleaning*, issued 2000).

Rationale

SSPC-SP-10 is the industry standard for surface preparation of carbon steel for application of most coating systems and particularly inorganic zinc primers. A suitable alternative depainting technology shall be capable of achieving a surface cleanliness level equal to SP-10.

Test Methodology

Table 3-3 Test Methodology for SSPC Surface Cleaning Level	
Parameters	Per SSPC-SP-10/NACE-No. 2
Field Test Evaluation	Each process or media shall be tested for appropriate surface preparation
Acceptance Criteria	Concurrence that technology meets agreed upon cleaning level using visual determination using SSPC Surface cards at 10X magnification

Unique Equipment or Instrumentation

- 10X optical magnifier

Data Analysis and Reporting

- An engineering evaluation substantiated by a written description on the "Depainting System Field Evaluation and Inspection Report" (Appendix A), or an equivalent form, and photographs.

3.2.4. Surface Profile/Roughness

Test Description

This test serves to evaluate substrate damage as a result of using the coating removal technology. Surface roughness shall be measured in accordance with NACE-STD-RP0287 (*Field Measurements of Surface Profile of Abrasive Blast Cleaned steel Surfaces Using a Replica Tape*, revised 2002). Any surface abnormalities shall be noted and photographed.

Rationale

Due to the potential for substrate damage posed by any coatings removal process, preliminary appraisal must be made to estimate the magnitude of this potential.

Test Methodology

Strip specimen and clean if necessary to remove stripping residues. Measure the surface roughness. A minimum of five readings shall be performed along different directions and different places in the panel. Record each of the readings.

Table 3-4 Test Methodology for Surface Profile/Roughness	
Parameters	Per NACE-STD-RP0287
Field Test Evaluation	Each process or media shall be tested to determine if appropriate surface profile is achieved
Acceptance Criteria	Concurrence that technology meets agreed upon surface profile using visual determination

Unique Equipment or Instrumentation

- Per NACE-STD-RP0287

Data Analysis

- An engineering evaluation substantiated by a written description on the “Depainting System Field Evaluation and Inspection Report” (Appendix A), or an equivalent form, and photographs.

3.2.5. Waste Generation

Test Description

This test will assess the waste streams generated by the process. Assessment will include the waste quantity, determination of regulated wastes, and waste stream containment.

Rationale

Generation of regulated wastes and waste quantity are cost factors to consider in selection of depainting technologies. Additionally, waste stream containment and the ability of the selected method to control visible emissions will determine the requirement of containment structures that require cost consideration.

Test Methodology

- Waste Quantity—Contain and collect wastes generated during depainting of the test structure. Determine mass and volume of the collected waste.
- Fugitive Emissions—A subjective evaluation of fugitive emissions, both particulate and liquid runoff.
- Regulated Wastes—Collect bulk sample of contained wastes for analysis per 40 CFR Part 261.

Table 3-5 Test Methodology for Waste Generation	
Parameters	Regulated waste—EPA regulatory criteria (40 CFR Part 261); Fugitive Emissions - TBD
Field Test Evaluation	Analysis of waste generation rate, visible emissions control, chemical analysis of bulk waste; containment effectiveness, cost
Acceptance Criteria	Less than current abrasive blasting techniques

Unique Equipment or Instrumentation

- None

Data Analysis and Reporting

- EPA test results.
- Fugitive emissions report.
- Bulk waste quantification will be reported on the “Depainting System Field Evaluation and Inspection Report” (Appendix A), or an equivalent form.

3.2.6. Particulate Generation

Test Description

This will provide a baseline assessment of employee exposure to aerosols generated during the depainting process. A baseline exposure assessment will be conducted to identify typical employee exposures to depainting media of all phases (preparation, depainting, clean-up).

Personnel dosimetry monitoring and area monitoring will be used to characterize exposure levels.

Rationale

This test will be used to determine if typical employee exposures to air contaminants generated during depainting operations comply with the Threshold Limit Values (TLVs) Time-Weighted Average (TWA) exposure levels published by the American Conference of Governmental Industrial Hygienists (ACGIH). Test results will confirm use of recommended personal protective equipment and identify possible exposure hazards.

Test Methodology

Measurement of air contaminant levels may be determined using either real-time monitoring devices or sample collection methods requiring subsequent laboratory analysis. (Actual test methods are TBD pending MSDS review.) Laboratory analysis of collected media will be by a laboratory certified by the ACGIH.

Table 3-6 Test Methodology for Particulate Generation	
Parameters	TLV TWA exposure levels published by the ACGIH
Field Test Evaluation	Baseline hazard assessment with sample collection for laboratory analysis or real time measurement; PPE effectiveness
Acceptance Criteria	Less than current abrasive blasting techniques

Unique Equipment or Instrumentation

- TBD

Data Analysis and Reporting

- Report to include observations of field test set-up; description of procedures and work practices. Description of test methods and sample analysis. Table of monitoring results with comparison to applicable OSHA Permissible Exposure Levels (PEL) and TLV-TWAs. Findings on Personal Protective Equipment (PPE) effectiveness and discussion of possible exposure hazards and their relation to observed procedures and work practices. Photographic documentation of procedures and work practices.
- Quantification of Particulate generation will be reported on the "Depainting System Field Evaluation and Inspection Report" (Appendix A), or an equivalent form.

3.2.7. Coating Removal Damage Appraisal

Test Description

The following tests serve to evaluate preliminary substrate damage as a result of using the alternate coating removal technology. Test materials/substrates shall be examined for Warping/Denting and Metal/Composite Erosion. Observations for substrate damage shall be made immediately following the coating removal process. Any surface abnormalities shall be noted and photographed.

Rationale

Due to the potential for substrate damage posed by any coatings removal process, a preliminary appraisal must be made to estimate the magnitude of this potential.

Warping/Denting

As applicable, examine all metallic substrate materials after application of the de-paint process for any indications of warping and/or denting. This is expected to be an engineering evaluation and shall be substantiated by a brief written description supported by photographic documentation of the substrate surface following application of the de-painting process. This evaluation shall be conducted after each of four removal cycles.

Metal Erosion

Document any tendency for a de-paint process to remove or erode a metallic surface. Any pitting or apparent abrasion of the surface should be considered potential substrate erosion. Provide a brief written description and photographic documentation of the substrate surface following the application of the de-painting process. Examine for surface cracking, pitting, or roughening.

Test Methodology

Table 3-7 Test Methodology for Coating Removal Damage Appraisal	
Parameters	10X Magnification of Stripped Surface for warping/denting; metal erosion
Field Test Evaluation	Each process or media shall be tested to determine if any substrate damage occurs
Acceptance Criteria	No warping/denting or metal erosion observable at 10X magnification.

Unique Equipment or Instrumentation

- 10X optical magnifier

Data Analysis

- An engineering evaluation substantiated by a written description on the “Depainting System Field Evaluation and Inspection Report” (Appendix A), or an equivalent form, and photographs.

4. REFERENCE DOCUMENTS

The documents in Table 5-1 were referenced in the development of this JTP. In addition, this report was leveraged from NASA AP2 Office Joint Test Protocol entitled *Joint Test Protocol for Validation of Alternative Low-Emission Surface Preparation /Depainting Technologies for Structural Steel*; *Potential Alternatives Report for Validation of Alternative Low-Emission Surface Preparation/ Depainting Technologies for Structural Steel*; and *Cost Benefit Analysis for Alternative Low-Emission Surface Preparation/Depainting Technologies for Structural Steel*, all of which were prepared by ITB; the Air Force (AF) document entitled *DRAFT Purchase Description Remover, Chemical, Non-Chlorinated Solvent Type, For Difficult-To-Remove Finishes at All Air Force Installations*, prepared by the AF Coatings Technology Integration Office (CTIO); and the Air Force Research Laboratory (AFRL) document entitled *DRAFT The Testing and Demonstration of Metal Wire Arc Sprayed Materials on Rocket Launch Facilities*, dated November 26, 2003, prepared by Science Applications International Corporation (SAIC).

Table 4-1 Summarized Test and Evaluation Reference Listing

Reference Document	Title	Date	Field Evaluation Test	Field Test Plan Section
NACE-STD-RP0287	<i>Method for Conducting Coating (Paint) Panel Evaluation Testing In Atmospheric Exposures</i>	Revised 2004	Surface Profile/ Roughness	3.2.4.
SSPC-SP-10/ NACE-NO. 2	<i>Near-White Blast Cleaning</i>	Issued 2000	SSPC Surface Cleaning Level	3.2.3.

Appendix A

Depainting System Field Evaluation and Inspection Report

DEPAINTING SYSTEM EVALUATION AND INSPECTION REPORT			
DATE		PROJECT REF. NO.	
PROJECT NAME		PAGE OF	
INSPECTION ORGANIZATION		LOCATION	
INSPECTOR		INSPECTOR	
PRODUCT MANUFACTURER / NAME			
1. EASE OF USE—Technician Evaluation			
NOISE LEVEL			
2. COATING STRIP RATE			
AVERAGE COATING THICKNESS		mils	
TOTAL STRIPPING TIME	min	CALCULATED STRIP RATE	
STRIPPING SURFACE AREA	ft ²	ft ² /min	
AVERAGE POWER CONSUMED			
COMMENTS			
3. SSPC SURFACE CLEANING LEVEL			
4. LEVEL OF WASTE GENERATED			
5. PARTICULATE GENERATION			
6. COATING REMOVAL DAMAGE APPRAISAL			
WARPING / DENTING—Technician Evaluation			
METAL / COMPOSITE EROSION—Technician Evaluation			
COMMENTS			
7. SURFACE PROFILE / ROUGHNESS			
READING #1		READING #6	
READING #2		READING #7	
READING #3		READING #8	
READING #4		READING #9	
READING #5		READING #10	
COMMENTS			
INSPECTOR'S SIGNATURE		DATE	